REMARKS

Request for an Examiner's Interview

The Applicants' Attorney hereby requests an interview with the Examiner in order to expedite the prosecution of this case.

Pending Claims

Claims 1-47 are pending. Claims 31-37 and 46 have been withdrawn. In addition, claim 5 is withdrawn with this Amendment and Response. The Applicants respectfully request rejoinder of the withdrawn claims upon allowance of independent claim 1.

Previous Election

Paragraph 1 of the Office Action indicates that the elections made in the February 19, 2008 Response to Restriction Requirement may not be proper because it does not appear that claims 5, 19, and possibly 26 read on FIG. 5. Claim 5 is withdrawn in this Amendment and Response. The Applicants submit that claims 19 and 26 read on the apparatus shown in FIG. 5. In particular, the Applicants submit that the apparatus shown in FIG. 5 can operate with a laser generating a pulsed optical beam. In addition, the Applicants submit that RF input port can be terminated with a resistance in order to reduce the associated noise figure. The Applicants request reexamination of claims 19 and 26. In addition, the Applicants request rejoinder of withdrawn claim 5 upon allowance of independent claim 1.

Amendments to the Specification

Paragraph 2 of the Office Action indicates that there are typographical errors in the specification and, in particular, that element 414 does not appear to be a waveguide. Element 414 is an electro-optic modulator and element 416 is an optical waveguide. Amendments to the specification were made to correctly reference the optical waveguide with reference number 416 instead of 414.

Rejections under 35 U.S.C. §103(a)

Claims 1-4, 6-18 and 20-30, 38-45 and 47 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,525,855 to Westbrook et al. (hereinafter "Westbrook"). Westbrook describes a terminal for use in an optical communications system that uses a modulator for both modulation and detection. Referring to Westbrook FIGS. 1 and 3A-3D, an optical signal containing modulated data is detected by the modulator. The modulator then generates an electrical data signal which is transmitted by an antenna. Simultaneously, the antenna receives radio data signals and converts the received radio data signals to electrical data signals. The modulator then modulates the received electrical data signals on the optical signal. The optical signal modulated with the received electrical data signals then propagates along the optical fiber and is received at the optical detector. See, for example, Westbrook column 6, line 52 to column 7, line 10.

The Office Action states that Westbrook teaches a bidirectional interface which has a Mach Zehnder modulator. The Applicants respectfully disagree. The Office Action refers to Westbrook column 10, lines 63 to column 11, line 18, which describes the use of external modulators, such as lithium niobate Mach Zehnder Interferometric (MZI) modulators. In this

section, Westbrook describes well known advantages of external modulators. In particular, Westbrook describes that external modulators can be driven with higher power optical signals and, therefore, can have relatively high signal-to-noise ratios compared with directly modulated lasers.

However, Westbrook does not describe a specific configuration of the terminal that includes an MZI modulator and, in particular, does not describe the how to configure the terminal as described in the present invention to improve the transmit/receive isolation. The Applicants believe that Westbrook is not describing the use of an MZI modulator in the terminal or bi-directional interface. Instead, the Applicants submit that Westbrook is referring to replacing the directly modulated laser in the transmitter with an externally modulated laser. In fact, the Applicants believe that an MZI modulator cannot replace the EAM in the terminal described in Westbrook because an MZI modulator does not have the detection capability of the EAM described in Westbrook.

Independent Claim 1

The Applicants submit that the terminal described in Westbrook does not teach or suggest all of the elements of independent claim 1. Referring to FIG. 5 of the present specification and to claim 1, Westbrook does not teach the claimed first waveguide having one end that is coupled to an input port that receives an RF transmission signal and having another end that is coupled to an RF bi-directional port that receives an RF reception signal and that transmits the RF transmission signal, where the first waveguide propagates a first traveling wave. In contrast, Westbrook describes modulating the RF transmission signal on the optical signal. In the apparatus described in connection with Westbrook FIG. 1, the RF transmission signal is

modulated using frequency division multiplexing and is introduced at the optical input 2 by the transmitter 1. See, for example, column 5, lines 22-26.

Thus, the Applicants submit that the apparatus described in Westbrook does not teach or suggest an input port that receives an RF transmission signal. The RF transmission signal is already modulated on the optical transmission signal before it reaches the terminal. The terminal converts the modulated optical signal to an electrical data signal. Therefore, the Applicants submit that for at least this reason, Westbrook does not describe the claimed first waveguide.

Furthermore, the Applicants submit that Westbrook does not describe the claimed non-reciprocal coupler that couples fields from the first waveguide to the second waveguide, wherein (1) the RF reception signal from the bi-directional port couples from the first waveguide to the second waveguide in a substantially non-reciprocal manner and then passes through the output port, and (2) the RF transmission signal from the RF input port passes through the first waveguide to the RF bi-directional port. In fact, Westbrook describes a terminal where the optical signal is modulated by a transmission electrical data signal that is transmitted by the antenna and is also modulated by received electrical data signals that are received by the antenna. See, for example, Westbrook column 6, line 52 to column 7, line 10.

According to Westbrook, the presence of both input and output electrical signals in the modulator will give rise to signal inter-mixing, which can lead to distortion of the downstream and upstream optical signals that will limit the performance of the modulator. See, Westbrook column 7, lines 11-16. In other words, the modulator described by Westbrook is not configured to be a non-reciprocal coupler as claimed in independent claim 1. In particular, the modulator described in Westbrook does not couple from a first waveguide to a second waveguide in a

substantially non-reciprocal manner because the optical signal is modulated with both the input and output electrical signals. In fact, the Applicants believe that the terminal described in Westbrook is reciprocal. In other words, if the inputs to the terminal described in Westbrook were reversed, there would be little change in performance. In contrast, if the input terminals were reversed in the bi-directional signal interface claimed in independent claim 1, the bi-directional signal interface would not operate.

The terminal described in Westbrook does not have high transmit/receive isolation because both the transmission electrical data signal and the received electrical data signals are modulated on the same optical signal. Consequently, the terminal described in Westbrook would have some "leaking" or "bleed-through," where transmission electrical data signals propagate in received electrical data signal channels. Such "leaking" or "bleed-through" of a stronger transmit signal can prevent the receiver from detecting the weaker desired receive signal. See, for example, Westbrook column 12, lines 53 to column 13, line 5. The present invention, as claimed by independent claim 1, is designed to substantially eliminate, such "leaking" or "bleed-through" by using the claimed non-reciprocal coupler. See, for example, paragraph 25 of the present specification. High transmit/receive isolation is necessary to perform simultaneous transmission and reception for many applications.

To be unpatentable under 35 U.S.C. §103(a), the differences between the subject matter sought to be patented and the prior art must be such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art. The Applicants submit that the bidirectional interface claimed in independent claim 1 is quite different from the apparatus taught by Westbrook as described above. The mere fact that Westbrook mentioned an MZI modulator with reference to the transmitter, but

not the terminal itself, does not render independent claim 1 obvious. As described above, a MZI modulator cannot be used in the terminal described in Westbrook because it cannot perform the detection function of the EAM.

Therefore, the Applicants submit that independent claim 1 is not obvious over Westbrook for at least the reasons that the first waveguide is not described as claimed in independent claim 1 and that the modulator is not configured to be a non-reciprocal coupler as claimed in independent claim 1. In addition, the Applicants submit that dependent claims 2-4 and 6-10 are allowable as depending from an allowable base claim.

Independent Claim 11

Independent claim 11 recites a method of interfacing a reception signal and a transmission signal that includes a step of propagating an RF transmission signal through a first waveguide to a bi-directional port without coupling a significant portion of the RF transmission signal to a second waveguide. As described in connection with the rejection of independent claim 1, Westbrook does not teach or suggest such a step. In contrast, Westbrook describes modulating both the RF transmission signal and the received electrical data signals on the same optical signal. Therefore, the Applicants submit that independent claim 11 is not obvious over Westbrook for at least this reason. In addition, the Applicants submit that dependent claims 12-26 are allowable as depending from an allowable base claim.

Independent Claim 27

Independent claim 27 recites a method of transmitting and receiving signals that includes the steps of receiving an RF transmission signal at an RF bi-directional port and

passing the RF transmission signal to the RF bi-direction port. As described in connection with the rejection of independent claim 1, Westbrook does not teach or suggest such steps. In contrast, Westbrook describes modulating both the RF transmission signal and the received electrical data signals on the optical signal. Therefore, the Applicants submit that independent claim 27 is not obvious over Westbrook for at least this reason. In addition, the Applicants submit that dependent claims 28-30 are allowable as depending from an allowable base claim.

Independent Claim 38

Independent claim 38 recites a transceiver that includes an electro-optic modulator having an RF input port that receives an RF transmission signal and that transmits the RF transmission signal. As described in connection with the rejection of independent claim 1, Westbrook does not teach or suggest such a modulator configuration. In contrast, Westbrook describes a terminal that includes an EAM modulator that detects transmission electrical data signals from an optical transmission signal and then provides the electrical data signals to the antenna. Therefore, the terminal in the configuration described in Westbrook does not include an RF input port that receives an RF transmission signal. Therefore, the Applicants submit that independent claim 38 is not obvious over Westbrook for at least this reason. In addition, the Applicants submit that dependent claims 39-45 are allowable as depending from an allowable base claim.

Independent Claim 47

Independent claim 47 recites a bi-directional signal interface that includes a means for propagating a transmission signal through the first waveguide to the bi-directional port

without coupling a significant portion of the transmission signal to the second waveguide. As described in connection with the rejection of independent claim 1, Westbrook does not teach or suggest such a bi-directional signal interface. In contrast, Westbrook describes modulating both the RF transmission signal and the received electrical data signals on the same optical signal. The Applicants believe that the terminal described in Westbrook exhibits significant "leaking" or "bleed-through," especially when the RF transmission signal and the received electrical data signals are at the same frequency. Therefore, the Applicants submit that independent claim 47 is not obvious over Westbrook for at least this reason.

Nonstatutory Obviouness-Type Double Patenting Rejections

Claims 1-4, 6-7, 9-18, 21-22, 24-25, 27-30, 38-45, and 47 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 3, 5-11, 14, and 16-41 of copending application No. 11/353,701. The Applicant will submit a terminal disclaimer to overcome this double patenting rejection.

CONCLUSION

Claims 1-47 are pending. Claims 5, 31-37 and 46 have been withdrawn. The Applicants respectfully request reconsideration of the pending claims in light of the above arguments.

The Applicants have requested a telephonic interview if the present rejections are maintained in order to expedite prosecution of the present application. The undersigned attorney would welcome the opportunity to discuss any outstanding issues, and to work with the Examiner toward placing the application in condition for allowance.

Respectfully submitted,

Date: October 8, 2008
Reg. No. 40,137

/Kurt Rauschenbach/

Kurt Rauschenbach, Ph.D.
Attorney for Applicant
Rauschenbach Patent Law Group, LLC
Post Office Box 387
Bedford, MA 01730

Tel. No.: (781) 271-1503
Fax No.: (781) 271-1527

3047v1